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OBSERVATIONS ON A UNIDIRECTIONAL FLIGHT OF ARMY CUTWORM MOTHS AND THEIR POSSIBLE BEARING ON AESTIVATION.

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The life history of the army cutworm moth (*Chorizagrotis auxiliaris* Grote), the larvae of which over-winter in the soil and mature early in the spring, is characterized by a spring flight in June, their almost complete disappearance during the early part of July and re-appearance during the latter part of August. The period during which they disappear is termed by other workers as an aestivation. They consider the moths to aestivate under clods of earth, matted weeds, etc., in the same locality in which the larvae developed, although conclusive evidence appears to be somewhat lacking in this respect. A moth having a similar life history is *Agrotis ypsilon* which is recorded as a pest in Egypt and certain parts of India. Williams in his recent book on Migration of Butterflies says they are present in very large numbers in April but at the height of their abundance they suddenly disappear and are not seen in any stage until the following autumn. He has some evidence that in the case of Egypt a migration takes place across the Mediterranean Sea to the Alps. In India it is assumed that they migrate some 200 miles to the mountains where they pass the summer.

During the season (1931) army cutworm moths were extremely abundant in certain parts of Montana and Alberta, their presence causing much annoyance in houses in the vicinity of local outbreak areas. They could be found at any time during the day in barns, granaries, sheds, and under boards, boxes, sacks, and other objects affording shelter. In order to carry out certain experiments many moths were collected and placed in large outdoor cages, but not a single specimen lived through to the egg-laying period in the fall. This same difficulty was met with by other workers when studying the life history. However, material kept under cold storage conditions survived the summer.

While collecting moths at Cottonwood Canyon 12 miles southwest of Bozeman, Montana, on July 14, what appeared to be rather a definite flight of *C. auxiliaris* was observed at sundown. The moths flew rapidly at a distance of one to two meters above the ground and with few exceptions in a southwesterly direction. An attempt was then made to collect data such as temperature, humidity and wind records, just previous to and during the flight to see if they could be correlated in any way with such migrations. Stations were selected from which observations were taken. Along with the above mentioned records counts were made of the number of moths flying across a definite area per minute. The average number recorded per minute during the peak of the

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flight was about twenty, the greatest number recorded being eighty. These observations were repeated on July 15, 16, 17, and 20. On the night of the 20th the observations were continued all night to see if the migration was continuous, or whether the moths after feeding returned to such places as under boards, sticks, bark, straw and dried up matted weeds where they were found during the day The usual evening flight took place, but this proved to be the last of the season as not a single specimen was discovered after this time even though intensive search was carried on in such places as are referred to above. A search was made in similar situations at higher altitudes in the nearby mountains, but with one exception (the finding of a moth secreted in a rock cliff about three miles from where the observations were made) only negative results were obtained.

The data obtained during this period showed that the maximum flight came about 8:30 p. m. and that with very few exceptions it was unidirectional toward the southwest. On comparing temperature, humidity, and wind records of this hour for the successive dates, it was found that no relationship was apparent between these factors and the time of migration. It was also found that no relation appeared to exist between the temperature of such places and concealment as are referred to and the air temperature at the time the moths were leaving them. The numbers per minute observed on the successive dates indicate that they were decreasing quite rapidly throughout this period.

The flight recorded suggests that possibly a migration occurs to higher elevations where aestivation may be successfully completed at lower temperatures than those experienced on the plains. Further evidence in support of this idea is that intensive search failed to reveal the moths at mid-summer in outbreak areas on the plains, and that they cannot be carried through the summer experimentally in outdoor cages, though they may be held over the summer in cold cabinets at temperatures averaging 37 deg. F.

NEW CANADIAN TRYPHONINAE (HYMENOP.; ICHNEUMONIDAE)*

BY G. STUART WALLEY,
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Euceros digitalis n. sp.

Male.—Length, 6 mm.; antennae, 5.5 mm.

Rather slender bodied. Head shining, punctate, punctures unevenly distributed, widely separated on clypeus; more dense on tumid portion of frons below antennae, in malar space and between ocelli and antennae; ocellocular space polished, impunctate; cheeks and temples obscurely punctate. Clypeus poorly defined at base, apically broadly rounded, slightly angulate and elevated at middle of free edge. Malar space five-sixths as long as basal width of mandible; cheeks moderately buccate; antennal scrobes rather shallow. Flagellum 29 segmented, the segments from the base becoming gradually broader and more compressed with their outer apical angles gradually more produced until a maximum is reached in segments 9, 10 and 11 which are very broad and flat with their outer apical angles produced to form slender cylindrical styles almost as

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long as one-half the width of the segment; inner apical angles of 9, 10, 11 and 12 with a smaller short stout spine-like projection; segments 13, 14, etc. decreasingly broadened and flattened until they become cylindrical in about the region of the 6 apical segments.

Thorax shining; propleura polished, in middle with very few punctures. Punctures of metapleura small, well separated. Mesonotum and scutellum with numerous small well separated punctures, less dense on scutellum. Propodeum with a strong carina between dorsal and posterior faces; dorsal face with rather sparse punctures; posterior face impunctate but with several irregular poorly defined carinae. Hind coxae two-thirds as broad as long. Nervellus of hind wings giving rise to longitudinal vein at posterior fourth.

First abdominal segment about as broad at apex as median length; spiracles prominent, elevated; anterior basin small, median carinae strongly elevated, converging closely posteriorly, distinct to apical third with space between elevated, surface shining, moderately punctate except for area between spiracle and carinae which is almost smooth; remainder of tergites more densely and regularly punctate.

Head mostly yellow; mandibles brownish tipped; palpi pale yellow; region of antennal scrobes black narrowly jointed along antennal furrows with the black triangle which occupies vertex and encloses the ocelli; occiput and posterior region of genae black, the black extending forward almost to eye at point just above malar space; middle of outer orbits broadly yellow. Scape black; flagellum black, the basal 13 segments with a median yellowish-brown stripe and segments 9 to 13 margined narrowly in front and more broadly behind with the same yellowish-brown; outer face of flagellum yellowish-brown, dusky at base, palest on expanded portion, becoming black on segments toward apex.

Thorax shining black with the following yellow markings: spot on mesonotum in front of tegula, narrow lateral margins and apex of scutellum, postscutellum, spot on mesopleura below tegulae, small dot on prepectus, narrow posterior margin of upper mesopleura. Tegulae brownish with a yellow spot on base. Coxae black, front coxae obscurely pale at apex, middle coxae narrowly pale at base; trochanters yellow; front femora and tibiae yellow in front, dark brownish behind; all femora with narrow yellowish apices; middle femora and tibiae mostly brownish but tinged with yellow throughout their length in front; hind femora and tibiae black, the tibiae with a yellow basal band; front tarsi sordid yellow; middle tarsi brownish; hind tarsi yellow except for blackish basal half of first segment. Wings hyaline with apices faintly dusky; veins and stigma dark brown.

Abdominal tergites black; first tergite with apex narrowly yellowish, the tollowing tergites each bearing on its posterior third a transverse dark reddish brown band which does not attain the lateral margins.

Holotype—♂, Ottawa, Ont., May 29, 1925, (C. H. Curran); No. 3310 in the Canadian National Collection, Ottawa, Ont.

Paratypes—2 ♂ ♂, same data as holotype.

Notes—The two paratypes agree in size and structure with the holotype as described above. The color of the abdomen varies somewhat, one has the

tergites wholly black beyond the first, the other has the hind femora reddish brown and the abdomen chiefly reddish with the black confined to the basal and lateral margins of the tergites.

This species is about the same size as a small example of *couperii* from which it differs in the form of the antennae, sculpture of thorax and its general darker color.

Euceros decorus n. sp.

Male—Length, 7 mm.; antennae, 6.5 mm.

Form of body as in *couperii*. Head rather shining, punctate, punctures unevenly distributed, widely separated on clypeus, rather dense on frons especially at middle, numerous on malar space and between ocelli and antennae; ocellocular space polished, impunctate; cheeks with a few punctures below, above and on temples with only a few obscure punctures. Clypeus poorly defined at base, apically broadly rounded, slightly elevated at middle of free edge. Malar space almost five-sixths as long as basal width of mandible; cheeks moderately buccate; antennal scrobes shallow, finely punctate. Flagellum 33 segmented, segments from the base becoming gradually broader and more compressed until a maximum is reached in segments 9, 10 and 11 which are very broad and flat; segments 8, 9, 10 and 11 have their outer apical angles slightly produced as in *couperii*, with their inner apical angles with a short stout spine-like projection; segments 12, 13, etc. decreasingly broadened and flattened until they become cylindrical in about the region of the 6 apical segments.

Thorax shining; propleura polished, in middle with very few punctures. Punctures of metapleura small, well separated. Mesonotum rather densely punctate especially on middle lobe; scutellum with fewer well separated punctures. Propodeum with well defined carina between dorsal and posterior faces; dorsal face small, very short, roughened but not distinctly punctate; posterior face large, with two well defined lateral carinae, the area between irregularly rugose. Hind coxae two-thirds as broad as long. Nervellus of hind wing giving rise to weak longitudinal vein at posterior third.

First abdominal segment about as broad at apex as median length; spiracles slightly elevated, not projecting beyond lateral margin of tergite; median carinae distinct to apical third with space between beyond basin, elevated, shining. Tergites, moderately, rather evenly punctate.

Head including palpi mostly yellow; mandibles brown tipped; black Y-shaped mark between antennae; a black triangle on vertex enclosing ocelli and touching eye at a point, continuous posteriorly with the black occiput. Cheeks and temples yellow. Scape black, the segments brownish tipped. Flagellum yellowish brown; basal eight segments with very obscure median yellowish stripe; segments 9 to 12 margined narrowly in front and a little more broadly behind with pale yellowish brown; outer face of flagellum pale yellowish brown throughout.

Thorax black and orange yellow. Prothorax black with pale along anterior margin and in posterior angle. Remainder of thorax yellow as follows: lateral margins of mesonotum broadly in front, narrowly behind; two stripes before scutellum narrowly joined with lateral areas along parapsidal furrows;

elevated portion of scutellum except small basal spot; postscutellum; lower half of mesopleura and metapleura and outer half of mesosternum; posterior face of propodeum except for two black spots. Tegulae yellow. Entire front and middle legs, narrow base and apex of hind coxae, hind trochanters, apex of hind femora, base of hind tibia, hind tarsi throughout, yellow. Hind femora and tibia piceous, hind coxae black.

Abdominal tergites reddish brown, space between carinae and apex of first tergite yellowish, a black spot on either side at middle of tergite. Tergites 2, 3 and 4 obscurely paler at apex.

Holotype—♂, Aweme, Man., June 25, 1919, (N. Criddle); No. 3311 in the Canadian National Collection, Ottawa, Ont. Experiment No. 8012.

Allotype—♀, Aweme, Man., June 17, 1920, (N. Criddle). Experiment No. 8012.

Host—Both holotype and allotype were reared from *Lygaeonematus erichsoni* Hart. according to data received from Mr. Criddle.

Notes—The allotype differs in color in having the frons with a large quadrate black spot, the propleura wholly black, the mesopleura, metapleura and propodeum largely so. The front and middle coxae are blackish except at apices. The antennae are black except the apical third which is orange-brown.

This species is evidently allied to *couperii*. A series of the latter from Laniel, Que., bred from a species of *Neodriprion* are much more uniformly dark in color with the hind femora reddish and the hind basi-tarsi black on the basal half. The male antennae of the two species are similarly modified in their expanded portions.

Euceros neodiprioni n. sp.

Male—Length, 6.5 mm.; antennae, 6 mm.

Form of body as in *couperii*. Head shining, punctate, punctures unevenly distributed, sparse on clypeus, rather dense on frons, malar space and between ocelli and antennae; ocellocular space polished, impunctate; cheeks moderately, temples obscurely punctate. Slight median depression at base of clypeus; apex broadly rounded with usual slight elevation in middle of free edge. Malar space almost five-sixths as long as basal width of mandible; cheeks moderately buccate; antennal scrobes shallow with a few punctures. Flagellum 29 segmented, segments from the base becoming gradually broader and more compressed until a maximum is reached in segments 9 and 10 which are very broad and flat; segments 8, 9 and 10 have their outer apical angles slightly produced as in *couperii* and *decorus*, with their inner apical angles with a short spine-like projection; segment 11 still quite broad, segments 12, 13, etc. decreasingly broadened and flattened until they become cylindrical in about the region of the 6 apical segments.

Thorax shining, propleura polished, in middle with few punctures. Punctures of metapleura moderately large, well separated. Mesonotum and scutellum with numerous punctures, most dense on middle lobe of former. Propodeum with well defined carina between dorsal and posterior faces; dorsal face almost as long as posterior, punctures narrowly separated; posterior face irregularly rugose. Hind coxae two-thirds as broad as long. Nervellus of hind wing giving rise to weak longitudinal vein at posterior fourth.

First abdominal tergite about as broad at apex as median length; spiracles only slightly elevated, not projecting beyond lateral margin of tergite; median carinae distinct to middle; elevated portion between carinae punctate. Tergites evenly, rather densely punctate.

Head including palpi pale yellow; mandibles pale yellow, brown tipped; antennal scrobes narrowly black; vertex including ocellar triangle, posteriorly extending to eyes, occiput and temples narrowly behind, black; cheeks pale yellow. Antennae mostly black; basal eight segments inwardly with a very obscure brownish stripe; 9, 10 and 11 with narrow anterior and broader posterior dirty yellow margins; segments beyond black. Outer face of eleven basal segments dirty yellowish, beyond brownish then black.

Thorax mostly black marked with pale yellow as follows: spot on mesonotum before tegulae, small spots before scutellum, margins of scutellum, metanotum, dash on mesopleura above episternauli, spot below joined to pale prepectus, hind margin of mesopleura, front and middle coxae, all trochanters, front and middle femora and tibiae in front, all tarsi (front and middle dusky) except basal three-fourths of hind tarsi, apex of hind femora and base of hind tibiae. Front and middle femora and tibiae brownish behind. Hind coxae, femora, tibiae and basal three-fourths of hind basi-tarsi, black.

Abdominal tergites shining black, the apices of tergites 1-5 obscurely narrowly yellowish.

Holotype—♂, Laniel, Que., Aug. 7, 1930, (M. B. Dunn); No. 3312 in the Canadian National Collection, Ottawa, Ont.

Paratype—♂, same data as holotype.

Host—Bred from cocoons of a species of *Neodiprion* infesting *Pinus banksiana.*

Notes—In general appearance this species resembles *digitalis*, which differs, however, in thoracic and abdominal maculation, color of front and middle coxae, form of antennae and puncturation of the propodeum.

I have at hand a single female, slightly larger, which emerged at Ottawa in the laboratory, Jan. 5, 1931, from a *Neodiprion* cocoon from Laniel, Que. This is possibly the female of *neodiprioni*. The femora and tibiae are reddish brown, the hind tibiae tinged with piceous, the front and middle coxae are largely blackish, the antennae wholly so and the face bears the usual blackish quadrangle. The abdominal tergites are wholly black, except the first which has a narrow yellow margin.

Euceros angulicornis n. sp.

Male—Length, 10.5 mm.; antennae, 10 mm.

Robust. Head shining, punctate; punctures on clypeus large, widely separated, smaller and denser on front below antennae, on malar space and between ocelli and antennae. Clypeus moderately convex, apex subtruncate elevated at middle. Malar space fourth-fifths as long as basal width of mandible; cheeks moderately buccate; antennal scrobes moderately deep. Flagellum 37 segmented, the segments from the base becoming gradually broader and more compressed until a maximum is reached in segments 9, 10 and 11 which are very broad and flat. The outer apical angles of segments 8 to 11 are angularly produced somewhat as in *couperii;* the inner apical angles of segments 8 to 12 each terminate

in a short stout spine-like projection; segments 13, 14, etc., decreasingly broadened and flattened until they become cylindrical in about the region of the 8 apical segments.

Thorax rather shining; propleura polished, with a few minute punctures. Mesopleura with numerous well defined punctures. Mesonotum finely punctate especially on middle lobe; scutellum more coarsely punctate. Propodeum with dorsal and posterior faces separated by a strong transverse carina; dorsal face rather densely punctate; posterior face with well defined lateral carinae the space between weakly rugose. Hind coxae one-half as broad as long. Nervellus of hind wing giving rise to longitudinal vein at its posterior third.

First abdominal segment about as broad at apex as median length, spiracles scarcely elevated, anterior basin well defined, median carinae slightly elevated to middle of tergite, surface rather densely punctate except adiacent carinae; remainder of tergites regularly and rather densely punctate.

General color light brown tinged with sanguineus. Palpi yellowish, mandibles black tipped. Narrow inner margin of antennal scrobes, most of space, ocellar triangle joined with upper half of occiput, black. Flagellum light brownish a little darker on inner side at base with pale median stripe on inside of basal 12 segments, narrow anterior and broader posterior inner margins of segments 8 to 13, broad indistinct median yellowish stripe on outer side of segments 8 to 13.

Thorax more reddish with black as follows: prosternum and propleura in front, narrow median stripe on mesonotum, depression before scutellum, oblique stripe from base of wing to mesocoxae on mesopleura, posterior two-thirds of mesosternum, anterior suture of metapleura, metasternum, margins abdominal socket of propodeum. Legs reddish as in thorax, outwardly a little paler. Abdomen uniformly light brown with sanguineus tinge.

Holotype—♂, British Columbia (Hanham); No. 3313 in the Canadian National Collection, Ottawa, Ont.

Allotype—♀, Victoria, B. C., June 4, 1898, (Rev. G. W. Taylor).

Notes—The allotype resembles the female of *flavescens* Cress. It differs from the holotype in being more uniformly brownish with the blackish areas reduced on the head, mesonotum and mesopleura and the antennae with a submedian blackish band on segments 7-13.

RECORDS OF ADDITIONAL EUROPEAN SAWFLIES IN AMERICA AND DESCRIPTIONS OF NEW VARIETIES OF NORTH AMERICAN SPECIES

BY HERBERT H. ROSS,

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A. ADDITIONAL EUROPEAN SAWFLIES IN AMERICA.

(1) **Hemichroa crocea** Geoffroy

This species has apparently been introduced in recent years and become established as a pest of the common native alder (*Alnus rubra*) on the west coast of Washington and British Columbia, particularly in the lower part of the Fraser River Valley. The earliest specimens I have at hand are a series of 15 females taken at White Rock, B. C., June 28, 1929, collected by Mr. G. Beall.

Mr. R. Glendenning has informed me that in 1930 it caused considerable damage to the native alder at Rosedale, near Agassiz, B. C. Adults were taken in 1930 at Milner and Langley also by Mr. Kenneth Graham. In 1931 Mr. Hugh Leech wrote me that it was well established in the vicinity of Vancouver. In Europe the sawfly is recorded as feeding on species of alder and birch. Mr. Robert Benson, of the British Museum, has kindly checked my determination of this species.

Very recently Rohwer and Middleton (Proc. Ent. Soc. Wash., Vol. 34, No. 6, June, 1932, p. 97) have described this species as *Hemichroa washingtonia* n. sp., stating that it differs from *H. crocea* in characters of the head, sheath and wing venation. Examination of six collections, totalling 70 specimens, from various localities in British Columbia, shows that the wing venation varies to an extreme degree, and that the sculpturing of the head and the shape of the sheath also vary to some extent along the same lines as the differences cited by the above authors. Reared collections of larvae from Agassiz and Vancouver have been studied, and these agree perfectly with the descriptions of the larvae of *H. crocea* given by European authors. In view of this there seems little doubt to me but that we are dealing with the European species and not with a new North American one. The specimens upon which the description of *washingtonia* was based were collected in 1923 and 1927 at Seattle, Wash., a large seaport, and only 180 miles south of the localities cited in this paper.

(2) **Selandria stramineipes** Klug

Selandria urbis Ross, Can. Ent., Vol. LXII, No. 8, Aug., 1930. *New synonymy.*

Mr. Benson has recently drawn my attention to the fact that *S. urbis,* described from Vancouver, B. C., is a synonym of the European *S. stramineipes.* This sawfly feeds on common bracken (*Pteris aquilina*), and has been taken very abundantly in 1930 and 1931 at various localities near Vancouver, including New Westminster and Milner, B. C. Since bracken is such a common and abundant plant in the lower Fraser River Valley, this species will probably become widely distributed and abundant in this area.

(3) **Tomostethus luteiventris** (Klug)

The earliest records I have of this species in North America are one female collected at Framingham, Mass., May, 1916, by C. A. Frost, and eight females collected by T. H. Hubbell in Washtenaw County, Michigan, as follows: 1 ♀, Cavannah Lake, May 24, 1919; 7 ♀♀, Geddes, First Sister Lake and Pittsfield Ponds, Ann Arbor, May 23 and 24, 1918; May 18, 1919, and May 9, 1920. Another female was taken at Mendham, N. J., June 1, 1923, by F. M. Schott. More recently I have received nine females collected at Vancouver, B. C., on snow, Seymour Mt., alt. 4700 ft., May 31, 1931, by H. B. Leech.

This species is readily distinguished from all other nearctic species of the genus by having the abdomen red with a median black stripe and the head and thorax entirely black. According to European authors the male is very similar to the female. Enslin states that the species is distributed over all Europe, and is not rare, but that the male is seldom captured, perhaps indicating a normally parthenogenetic existence.

The following description of the female may be helpful in its determination. Length 5.5 to 6 mm. Color.—head and thorax (except legs) black, abdomen mostly bright orange with the basal plates, most of second tergite, a narrow line along the meson on tergites three to seven, more or less of segments eight to ten, and the sheath and adjacent sclerites, black; legs mostly black, with the following areas orange: apical half (or slightly more or less) of front and middle femora, hind femora except small black ring at base, front and middle tibiae except blackish suffused area at apices, and hind tibiae except small apical black spot: tarsi black with a slight reddish cast; wings faintly brownish infuscate, stigma and veins brownish black. Sheath almost twice as long as wide, upper margin straight to tip, lower one straight for basal half, then curving to the upper in an almost perfect quarter circle.

(4) **Tomostethus ephippium** Panzer

Selandria inhabilis Norton, Proc. Boston Soc. Nat. Hist., Vol. VIII, 1861, p. 220. *New synonymy.*

This species, under the name of *Tomostethus inhabilis,* has been reported many times from the Eastern part of North America, although it is apparently never abundant. Three females were collected at Langley, B. C., May 11-30, 1931, by Kenneth Graham, this constituting the most western record of the species. Specimens from various localities in North America check so closely with specimens from England that there is no doubt as to the identity of the species.

In reviewing the data on the known occurrence of these four species in North America it seems fairly certain that *Hemichroa crocea* and *Selandria stramineipes* have been recently introduced into the continent. The fact that Seattle, Washington, and Vancouver, B. C., are large seaports, touched by many ships from all over the globe, makes them admirable points at which alien species may gain admittance. The sudden appearance in large numbers of the two species mentioned is an added point for considering them introduced. The scattered nature of the records of *Tomostethus luteiventris* and *T. ephippium* are suggestive that they are true holarctic species and occur here indigenously.

I wish to express my gratitude to Mr. Robert Benson of the British Museum for a great deal of assistance in either determining specimens of the above species or sending me European material for comparison.

B. NEW VARIETIES OF NORTH AMERICAN SPECIES.

Monosoma inferentia var. **andronosa** new var.

Female.—Similar in structure to the typical form, but differing markedly in color, having the ground pattern of the entire body brownish black instead of light rusty red. Head and antennae black, with the labrum whitish and the apical half of the clypeus and most of the mandibles yellowish brown; thorax dark brownish black, with the margins of the pronotum, the tegulae and the base of the wing veins whitish; abdomen a slightly lighter shade of brownish black, the apical margins of all the sclerites narrowly whitish; legs a semi-translucent dark reddish brown, shading in places to blackish, except the trochanters, apices of coxae, bases of tibiae and apices and bases of femora, which are luteous. Known only from the holotype.

Holotype.— ♀ ; Biscotasing, Ontario, June 6, 1931 (Karl Schedl). Deposited in the Canadian National Museum, Ottawa, Canada.

This form of the female is colored almost exactly as is the male of the species, which is apparently always black. The species was described from a male from Connecticut, and females from this locality and from Ithaca, N. Y., have the thorax, abdomen and legs mostly dull rusty red in color, as described by MacGillivray. Since the red form of the female is found in the typic locality and has further been described as the typic form, it seems best to consider it as such, even though on the basis of color the dark form has a more logical claim. That this new dark form is only a variety and not a distinct species is upheld not only by the fact that it possesses no structural distinctions, but also by the fact that a female from Ithaca, N. Y., shows a decided tendency for parts of the red area to be suffused with brownish.

Strongylogaster annulosus var. **cingulescens** new var.

Female.—Structurally identical with the typical form, differing only in color, having the terga of the abdomen with the basal half or two-thirds black and the apical portion whitish yellow, and the sterna similarly banded with black and yellow. The typical form has the basal portion of the terga more brownish and the sterna entirely yellowish brown. In its extremely cingulate appearance this new variety may be easily confused with other species of the genus but can be distinguished from them by the very long and spreading pads of the scopa of the sheath.

Male.—The males usually associated with females of the above description differ from males of the typical form in having darker and somewhat brown areas at the base of the terga. The distinction, however, does not always hold and it seems better to separate them on association with the females.

Holotype.— ♀ ; Douglas Lake, Michigan, July, 1928 (C. H. Kennedy). Deposited in the collection of the Illinois State Natural History Survey, Urbana, Ill.

Allotype.— ♂ same data as holotype and deposited with it.

Paratypes.—1 ♀ same data as holotype; 6 ♂ ♂, 7 ♀ ♀, Biscotasing, Ont., June 4-16, 1931 (Karl Schedl); 1 ♀, Woodworth's Lake, N. Y., May 30, 1908; 1 ♀, Lake Clear, N. Y., June 7, 1906; 2 ♂ ♂, Palos Park, Ill., June 17, 1917 (W. J. Gerhard); 1 ♂, 1 ♀, Hessville, Ind., May 28, 1911 (W. J. Gerhard); 1 ♂, Hessville, Ind., May 30, 1914 (W. J. Gerhard); 1 ♀, Hessville, Ind., May 31, 1915 (E. Liljeblad). Paratypes deposited with the holotype and in the Canadian National Museum, the Field Museum of Chicago, Ill., the New York State Museum, the U. S. National Museum, and the collection of Professor C. H. Kennedy of Ohio State College.

Crabo americana var. **rubrosa** new var.

Male.—Similar in structure to other varieties of the species but differing from the typical form and the variety *ulmi* in having the abdomen red, as in the variety *laportei*, and differing from var. *laportei* in having the wings clear except for a small area basad of the stigma and the apical margin of the front wings and the outer margin of the hind wings, which are infuscate with brown and contrast greatly with the other portion of the wings. The distinctive color combination of the variety is as follows: head, thorax and legs (except tarsi) dark reddish brown or black, abdomen red, wings hyaline with the above mentioned markings, antennae and tarsi yellowish. Paratypes indicate that the head, parts

of the pronotum, the tegulae, scutellum and legs may be suffused with reddish brown; the abdomen may have the first segment (basal plates) or the first and second black; and the markings on the wings may be dark or faint.

Holotype.—♂; Douglas Lake, Michigan, July, 1928 (C. H. Kennedy). Deposited in the collection of the Illinois State Natural History Survey, Urbana, Ill.

Paratypes.—all ♂♂. Illinois — 1, Algonquin, June 1, 1905 (W. A. Nason); 1, Cook County (E. L. Chope); 2, Chicago, June 18, 1917 (A. B. Wolcott); 1, Chicago, June 24, 1907 (C. A. Gardner). New York—1, Ithaca, June 6, 1906. South Dakota—2, Brookings, June 18, 1921 (H. C. Severin). Manitoba—1, Aweme, July 18, 1912 (N. Criddle); 1, Winnipeg, June 12, 1898. Ontario—2, Biscotasing, June 27 and 29, 1931 (K. Schedl); 1, Nepigon, July 1, 1887; 1, Ottawa (W. Harrington); 1, Ottawa, July 17, 1912 (Beaulieu); 1, Ottawa, July 21, 1907 (C. H. Young); 2, Sudbury, 1893 and June 17, 1892; 1, Meach Lake, July 21, 1907 (A. Gibson); 1, E. Ont. Quebec—2, Montreal; 1, Fort Coulonge, June 1, 1918 (J. I. Beaulne). Deposited in the collections of the Canadian National Museum, Cornell University, Professor C. H. Kennedy, and with the holotype.

THE FOOD PLANTS OF THE LEAFHOPPERS FORMERLY INCLUDED IN THE GENUS PLATYMETOPIUS BURM.

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Most writers in discussing the food plants of leafhoppers in the past have assumed that the majority of them were grass feeders. In the last few years a considerable amount of careful work has been done with the result that it is now evident that in a number of important groups the food plants are rarely if ever grasses.

Most of the early work in this country was done in the eastern part where grass is either the major land covering or else an important under-cover in the deciduous forests so that it was difficult to eliminate it from consideration. The author in his previous work in the western desert regions and especially in the last two years in Arizona has been especially fortunate in finding many areas in which one plant or another occurred in almost pure stands and where grass was practically absent. Under such conditions it has been possible to secure nymphs and adults and work out food relationships with much greater certainty than can be done in the extremely complex mixtures of the humid regions.

In 1910 Van Duzee[1] published a valuable synopsis of the 24 species then placed in the genus *Platymetopius*. The writer in a recent article[2] has shown that that genus, founded on a European species of very different structure, is not available for any of the American forms that have heretofore been referred to the group. To remedy this situation, the species, which have now increased to 50, were segregated into a number of distinct generic groups and a synoptic key provided for their separation.

(1) Ann. Ent. Soc., Amer. III, pp. 214-231, 1910.
(2) Can. Ent. 63 pp. 216-222 and 224-228, 1931.

In the present paper it is proposed to assign the known species to these groups and summarize what is known of their food habits. Complete life histories have not been worked out for many of the species but all records indicate that there are normally two generations per year, varying in time with the different localities and the development of their widely varying hosts.

Genus **Platymetopius** Burm.

Platymetopius palliolatus Ball. As stated in the previous paper this Texas species does not belong with the other American forms and nothing is known of its food habits. It may be an introduced form.

P. vitellinus Fh. This species which with *palliolatus* was formerly placed in *Mesamia* is more closely related to *undatus* the type of *Platymetopius* than to any other known group. The writer has reported this species as curling and reddening the leaves of roses. Later at Woods Hole it was found curling and coloring the leaves of blackberry and dewberry.

Genus **Japananus** Ball

Japananus hyalinus Osb. an introduced species of the Atlantic seaboard, feeds both as nymphs and adults, on the Japanese maple.

Genus **Scaphytopius** Ball

Scaphytopius elegans Van Duzee is a Pacific coast form which the writer has found feeding exclusively on the live oaks of that region. Var. *glennanus* Ball was found by the writer throughout southern Arizona feeding, both nymphs and adults, on the different live oaks, especially *Q. turbinella* and *oblongifolia*.

S. floridanus Ball with its var. *roseus* Ball are strictly confined to the underside of the live oak (*Q. virginiana*) in the Florida region. The margins of the leaves are revolute and furnish a fine hiding place for the young nymphs.

S. catalinus Ball and *ritanus* Ball have both been taken as nymphs and adults from the live oaks of southern Arizona, especially *Q. oblongifolia* and *emoryi*.

Genus **Deltopinus** Ball

Deltopinus nigriviridis Ball has been taken by the writer in abundance, both nymphs and adults, on *Hymenoclea monogyra* in southern Utah and Arizona. Var. *dixianus* Ball has been taken sparingly from *H. salsola* in the same regions and Van Duzee reports his *D. hymenocleae* from Lower California, Mexico, as taken from the same plant.

Genus **Cloanthanus** Ball

Cloanthanus majestus Ball. The types together with large nymphs were taken in June by the writer on a tall *Rhus* growing in isolated clumps at Pasadena, California. Four years later the same clumps gave only nymphs in July, but adults were taken from the same plant in August at Beaumont, California.

C. fulvus Osb. The writer found yellow nymphs swarming on Bayberry (*Myrica carolinensis*) at Woods Hole, Massachusetts, July 7, 1925, a few days later an immature adult that was determined as *fulvus* was taken from this spot. The nymphs were still abundant and apparently confined to this one shrub.

C. angustatus Osb. The types were recorded from Pine at Oyster Bay, New York, by Osborn. The writer has taken this species from the Jack pine in several places in northern Wisconsin and has examined specimens from New Hampshire (Lowry) taken from pitch pine.

C. collaris S & De L. is a closely related species with a darker thorax and lighter elytra for which there is no food plant record.

Genus **Platymoideus** Ball

Platymoideus trilineatus Ball. This California species was taken by the writer in number from *Rhus trilobata* in several places in the mountains around Prescott, Arizona.

P. pexatus Van Duzee is described as close to *trilineatus* and recorded as taken from "Yerba santa" (*Eriodictyon californicum*) in California.

P. rubidellus S & DeL. Nymphs and adults of this striking red form, described from Pennsylvania, were taken by W. E. Stone and the writer from Sweet Gum (*Liquidamber*) at Sanford, Florida.

P. slossani Van Duzee was taken by the writer in abundance everywhere in Florida. In several places larvae and adults were found on pure stands of a narrow-leaved sunflower (*Helianthus angustifolius*).

P. oregonensis Baker was swept by the writer both larvae and adults in abundance from mixed clumps of wild roses and snowberry (*Symphoricarpos*) at Wenatchee and LeGrande, Oregon.

P. acutus Say. The food plant of this abundant and widely distributed species has not been determined. *P. modestus* Stal was described from a region in which *acutus* is the most abundant species without giving any character that would differentiate it. It should be considered as a synonym until a study of of the type can be made.

P. cuprescens Osb., *latus* Baker and *planus* Van Duzee are species closely related to *acutus* and until such time as definite food plants are determined there will be confusion and mixing of these species in collections.

P. graneticus Ball. Females of this species were taken in some numbers from wild grape near Prescott, Arizona, July 17. It was apparently the last end of a brood as there were no nymphs or males present at that time. A single male was taken from wild grape in the mountains above Williams, Arizona, August 15.

P. guterranus Ball. Nymphs and adults of this species were found in abundance on *Gutierrezia californica* in northern Arizona.

P. abbreviatus DeLong. The writer found it fairly common on *Ceanothus americanus* at Sanford, Florida. DeLong described this species from two females from Tullahoma, Tennessee, and in the same paper lists *P. fuscifrons* Van Duzee on the basis of two males from the same place and date. These males are entirely too small, with too long plates to be *fuscifrons* but are no doubt the males of his *abbreviatus*.

P. cinereus Osb. & Ball. Attention was called in the original description to the fact that this species is only found in open grasslands and it was, therefore, inferred that it was a grass feeding species. With the present knowledge of food habits of the group it appears more likely that the food plant will prove to be some one of the shrubs or shrub-like plants that are found in such situations. *P. parvus* Lathrop is apparently a synonym of this species as he states that the male has a right-angled vertex and the female is 4 mm. long with orange on scutellum, characters that apply to *cinereus* but not to what he describes as *cinereus* in his South Carolina list.

P. oviedus Ball. This species either has several host plants on which it is

apparently equally at home or else several species, for which distinctive characters have not been discovered, are involved. The type material was taken along with the nymphs on a low mat forming heather—but either this or a closely allied species is abundant both nymphs and adults on a wire-stemmed Euphorbiaceae (*Chamaesyce sp.*) that forms large red mats in dry places and again on a finely branching aster-like plant abundant along the margins of wet places in Florida. *P. cinereus* of Lathrop's South Carolina list is no doubt this species as it is described as too small and too long-headed in the male for the true *cinereus* Osb. & Ball.

Genus **Nasutoideus** Ball

Nasutoideus nasutus Van Duzee has been taken in abundance, nymphs and adults, on the cliff rose (*Cowania stansburiana*) in Utah and Arizona.

N. diabolus Van Duzee from California has no recorded host.

N. verecundus Van Duzee was taken abundantly at Sanford, Florida, on mixed stands of low shrubs of the families *Ericaceae* and *Vacciniaceae* growing in flat woods.

N. andromus Ball. Nymphs and adults were taken commonly in Florida on the fetter bushes (*Pieris* spp.)

N. xanthanus Ball was taken by the writer exclusively on the bur sage (*Franseria ambrosioides*) in Arizona.

N. scriptus Ball from Kansas has no host record.

N. calliandrus Ball. This small dark species has been found only on the low clumps of the fairy duster (*Calliandra eriophylla*) in Arizona.

N. celtidis Ball is equally strictly confined, both nymphs and adults, to the evergreen desert hackberry (*Celtis pallida*).

N. irroratus Van Duzee has been taken in small numbers in many different places in California and Arizona but no food plant determined. Var. *nogalinus* Ball has been beaten in small numbers from oaks on the lower slopes of the mountains in southern Arizona. The small numbers and lack of nymphs would suggest that the adults may have flown up from some plant growing beneath the trees.

N. dodonanus Ball. Yellow nymphs and brownish yellow adults were taken exclusively on the shrub *Dodonaea viscosa* var. *angustifolia* in Arizona.

N. anisacanus Ball. The types together with the nymphs were taken on the mint-like plant (*Anisacanthus thurberi*) near Tucson, Arizona.

N. loricatus Van Duzee. This widely distributed species is found commonly in damp shady places late in the season and a few nymphs and many adults were taken on the Water-Wally (*Baccharis glutinosa*) which grows so abundantly in the washes in Arizona.

N. frontalis Van Duzee. This small dark species was taken in numbers on pure stands of wild blackberry, (*Rubus* spp.) in New Jersey, the District of Columbia and again at Gainesville, Florida. The latter place appeared to be about its southern limit.

N. dorsalis Ball, and *bicolor* DeLong have no food plant records.

N. desertanus Ball. This small gray species has been found breeding abundantly on the gray bur sage (*Franseria deltoides*) in Arizona.

N. heldoranus Ball. Another pale gray species breeding abundantly on the wild rubber plant (*Parthenium incanum*) in southeastern Arizona.

N. fuscifrons Van Duzee is apparently strictly confined to the buckbrush. The writer has taken it commonly in Utah and Arizona on *Ceanothus fendleri*.

N. compactus Ball was taken by the writer on a tall species of buckthorn (*Ceanothus* sp.) in northern California and has since been taken in small numbers in the higher mountains of Arizona.

N. magdalensis Prov. Dr. Osborn credits this to blueberries. Dr. Irene Debroscky tells me that she has carried this species through from egg to adult on the cranberry. The writer has taken this dark-faced species while sweeping shrubs in low damp places in northern Wisconsin and again at Woods Hole, Massachusetts, both situations where cranberries are abundant. *Platymetopius carolinus* Lath. is apparently a synonym of this species. His description fits and he did not list *magdalensis* although it is now known to occur in the South Carolina region. *P. obscurus* Osb. has already been reported as a synonym.

Note *P. nanus* V. D. (Jamaica) belongs in this genus and would fall between *loricatus* and *frontalis*.

Genus **Convelinus** Ball

Convelinus nigricollis Ball. This striking greenish yellow species with a black head is found as nymph and adults on the creosote bush (*Larrea tridentata*) in southern Utah and Arizona.

C. torridus Ball. This tawny or mottled species is also confined to the creosote bush and is a common form in southwestern Utah, Nevada and southern California.

C. analis, V.D., was described from the desert iron wood (*Olneya tesota*) in Lower California, Mexico. Var. *castranus* Ball the dark form common in Arizona is also confined strictly to that species.

Note *C. brevis* V.D. (Jamaica), *osborni* V.D. (Cent. Am.) *scutellatus* V.D. and *speciosus* V.D. (Lower Calif. Mex.) all belong to this genus.

THE NORTH AMERICAN SPECIES OF GLISCHROCHILUS (COLEOP.)*

BY W. J. BROWN,
Ottawa, Ontario.

The following study is based on the material in the Canadian National Collection supplemented by specimens from the collections of Messrs. Carl G. Siepmann, F. S. Carr, and G. Stace Smith. No new characters for the separation of closely allied species are offered in this paper. The most valuable characters known are those of the so-called flagellum of the male genitalia; the most useful for key purposes are presented by the elytral markings. Useful characters are in some cases found in the body form and in sexual modifications of the elytra and legs. Form and sculpture often vary with size and sex. As a general rule, in large males the head is relatively larger and the anterior part of the pronotum wider than in females or small males, and small females are frequently more closely and less finely punctate than larger individuals of the species. In

*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

his careful study of the characters and synonymy of *fasciatus* Oliv. and *quadrisignatus* Say (1931, Bull. Brook. Ent. Soc. XXVI, 24-35, pl. II), Mr. Siepmann has discussed adequately the characters that occur in the genus.

On account of lack of material, I have been unable to study the flagellum in the species of the *vittatus* group. However, I have noted its occurrence in each species of the group. The accompanying figures are not adequate illustrations of the structure but show its general form in most of the species of the *sanguinolentus* group. I have not seen male specimens of *obtusus* Say.

Our species of the genus fall into two groups which are probably of subgeneric value and which differ as shown by the first couplet of the following key. To the first of these, the *sanguinolentus* group, the name *Librodor* Reit., has been applied, *Glischrochilus* then being restricted to the second or *vittatus* group. I am unable with the literature at hand to determine the types of these genera and of *Ips* Fab. but suspect that all types will be found to belong to the *vittatus* group. The synonymy will then be as listed below and no name will be available for the *sanguinolentus* group. Reitter has always attributed *Glischrochilus* to Murray, apparently without valid reason, for Murray seems not to have used the name in the literature.

In the notes below, I have indicated the distribution of each species and have noted the type locality when it could be determined from the literature.

Glischrochilus Reit.

Glischrochilus Reit., 1873, Verh. nat. Ver. Brunn, XII, 162.
Ips Fab., 1776, Gen. Insect. Chilonii, 23 and 213 (*nec* DeG., 1775, Mem. servir l'hist. Insect. V, 190).
Librodor Reit., 1884, Wien. Ent. Zeit. III. 269 and 270; 1885, Wien. Ent. Zeit., IV, 174.

KEY TO SPECIES

1. Body wider, its width never less than two-fifths its length; moderately convex; often not quite parellel, the elytra usually a little wider near base than near apex. Pronotum never wider at apex than at base, with the sides feebly and evenly arcuate. Each elytron with the humeral angle joined to the umbone by a short, strongly impressed line. Intercoxal process of prosternum broadly rounded at apex. Legs rather stout; at least the anterior tarsi strongly dilated 2

   Body narrower, its width never greater than two-fifth its length; convex or depressed; parallel, the elytra never wider near base. Pronotum never wider and often narrower at base than at apex, the sides frequently sinuate or oblique before the posterior angles. Humeral angle of elytra without an impressed line. Intercoxal process of prosternum truncate at apex. Legs slender, the tarsi never strongly dilated. Venter always black 8

2. Metasternum and abdomen red 3

   Metasternum and abdomen black 4

3. Elytron red, the apical third, humeral angle, and a submedian spot, black ..... 1. *sanguinolentus sanguinolentus* Oliv.

   Elytron black, with a transverse basal and a post-median spot, red ..... 1a. *sanguinolentus rubromaculatus* Reit.

4. Length 8 mm. or more; elytron with two moderately large, subcircular, red spots ..... 2. *obtusus* Say

   Length less than 8 mm.; elytral spots variable but never at one time large, red, and circular 5

5. Elytral spots large, the basal distinctly trilobed, the basal and post-median equidistant from the suture ..... 3. *fasciatus* Oliv.

   Elytral spots variable, the basal oblique and quadrate when large, the post-median more suturad in position than the basal 6

6. Elytral spots very small, pale yellow, the basal slightly longer than the scutellum and parallel to suture, the post-humeral spot when present distant from the basal by twice the length of the latter, the post-median spot occupying one-fourth of the elytral width.....5. *siepmanni* n. sp.
Elytral spots usually much larger, reddish when small, the basal only very rarely parallel to the suture, the post-humeral when present less distant from the basal 7
7. Elytral spots smaller, the basal usually sublunate, sometimes subquadrate, the post-median occupying not more than three-fifths of the elytral width .....4. *quadrisignatus quadrisignatus* Say
Elytral spots larger, the basal subquadrate, the post median occupying seven-tenths of the elytral width.....4a. *quadrisignatus canadensis* n. subsp.
8. Elytron with the spots pale yellow, small, and linear, from three to five in in number, sometimes united to form narrow lines.....6. *vittatus* Say
Elytron with reddish markings which are never linear, rarely immaculate.. 9
9. Body almost three times as long as wide, rather strongly convex; lateral margins of pronotum straight, converging slightly toward the base..... .....9. *lecontei* n. m.
Body shorter, less convex; lateral margins of pronotum moderately and evenly arcuate or converging strongly in basal two-fifths.....10
10. Post-median spot of elytron strongly emarginate on its posterior margin.. .....8. *confluentus* Say
Post-median spot of elytron variable, rarely lacking, but never with the posterior margin emarginate .....7. *moratus* n sp.

1. Glischrochilus sanguinolentus sanguinolentus Oliv.

Nitidula sanguinolenta Oliv., 1790, Entomologie II, No. 12, 8, pl. II, fig. 14.

Length 4.5—6.2 mm. Body black, the metasternum and abdomen pale red; elytra pale red, each with the humeral angle, a submedian black spot, and apical third, black; the submedian spot circular, situated slightly in front of the middle, equidistant from the lateral and sutural margins and occupying from three-eights to five-ninths of the width of the elytron, much larger than the humeral spot; elytral epipleura colored like adjacent portions of the disk. Puncturation very fine, sparse. Legs not modified sexually. Male elytra with apical margins broadly rounded, the apices feebly produced; the apical margins strongly oblique and slightly sinuate before the apical angles in the female, these angles strongly produced. Male pygidium with or without the median line finely and feebly impressed for a short distance near middle; this median line in the female broadly and deeply impressed in about the median half. Flagellum as figured.

I have twenty-eight specimens from Montreal, Ft. Coulonge, and Hull, Que., Sudbury and Ottawa, Ont., Edmonton, Alta., Trinity Valley, B. C., White Mountains, N. H., Framingham, Mass., and Allegheny, Pa. The species was described from Georgia and Carolina, is recorded by Blatchley from Indiana, and is said by Horn to extend westward to Texas.

1a. Glischrochilus sanguinolentus rubromaculatus Reit.

Ips rubromaculatus Reit., 1873, Verh. nat. Ver. Brunn, XII, 161.

Elytra black, each with a basal and post-median red spot; the basal spot transverse, extending from the humeral umbone to a point near the suture (attaining the suture in one specimen), attaining the base only near the umbone, the elytral suture reddish near the spot; the post-median spot situated slightly behind the middle, strongly transverse, feebly arcuate, the posterior margin convex, separated from the sutural and lateral margins of the elytron by distances

equal to half the width of the scutellum; sub-equal in length to the basal spot. Other characters as in typical *sanguinolentus*.

I have three specimens from Bathurst, N. B., and Knowlton, Que. Reitter's types were from Florida. This may be a color form of *sanguinolentus*. Specimens intermediate in color are unknown to me, but Horn wrote that such were contained in his collection.

2. **Glischrochilus obtusus** Say.

Ips obtusa Say, 1835, Bost. Jour. Nat. Hist. I, 168; Lec. ed. II, 644.

Length 8-10 mm. Body black throughout; elytra black, each with a basal and a post-median red spot; each spot subcircular, occupying about half the width of the elytron; the basal spot equidistant from the sutural and lateral margins; the post-median spot a trifle smaller and situated slightly closer to the sutural than to the lateral margin. Puncturation close. Female elytra with the apical margins slightly oblique, the apices slightly produced; the pygidium very broadly rounded at apex, the apical portion of disk broadly depressed and slightly concave.

Two females collected by M. R. J. Sim at Riverton, N. J., are before me. According to Horn (1879, Trans. Am. Ent. Soc. VII, 323, pl. III, fig. 23) the male has the middle and posterior tibiae suddenly widened at middle, the pygidium truncate at apex and not concave, and the elytral apices as in the female. The flagellum has not been observed in this specis. Horn records *obtusus* from the middle and southern Atlantic states; Blatchley records it from Indiana.

3. **Glischrochilus fasciatus** Oliv.

Nitidula fasciata Oliv., 1790, Entomolgie II, No. 12, 7, pl. II, fig. 13.
Ips fasciata (Oliv.) Say, 1835, Bost. Jour. Nat. Hist. I, 169; Lec. ed. II, 645 (*nec* Fab., 1776, Gen. Insect. Chilonii, 213).
Ips 4-maculosa Melsh., 1844, Proc. Ac. Nat. Sci. Philadelphia, II, 107.
Ips geminatus Melsh., 1844, Proc. Ac. Nat. Sci. Philadelphia, II, 108.
Ips quadriguttatus Blatch., (*partim*), 1910, Coleop. Ind., 649 (*nec* Fab., 1776, Gen. Insect. Chilonii, 214).

Length 4-7 mm. Body black throughout; elytra black, each with a large basal and a post-median orange or reddish-yellow spot; the basal spot with its greatest length equal to its greatest width, separated from the suture by a distance not greater than half the width of the scutellum, a little closer to the lateral margin of the elytron, the spot strongly emarginate on its posterior margin and at the humeral umbone and therefore trilobed, sometimes emarginate on its sutural margin; the post-median spot strongly transverse, about half as long as the basal spot and occupying at least two-thirds of the elytral width, equidistant from the sutural and lateral margins of the elytron. Puncturation rather fine and sparse. Legs and pygidium without sexual modification. Male elytra with the apical margins slightly oblique, the apices slightly produced; in the female these margins strongly oblique and the apices strongly produced. Flagellum as figured.

I have seen thirty-eight specimens from Vineland Station and Hastings County, Ont., Hull and Kazubazua, Que., and Avenel, N. J., these last collected by Mr. Siepmann. The species was described by Olivier from Georgia and Carolina and by Melsheimer from Pennsylvania.

4. **Glischrochilus quadrisignatus quadrisignatus** Say.

Ips 4-signatus Say., 1835, Bost. Jour. Nat. Hist. I, 169; Lec. ed. II, 644.
Ips similis Melsh., 1844, Proc. Ac. Nat. Sci. Philadelphia, II, 108.
Ips bipustulatus Melsh., 1844, Proc. Ac. Nat. Sci. Philadelphia, II, 108 (*nec* Fab., 1787, Mant. Insect. Hafniae I, 45).

Ips bipunctatus Melsh., 1844, Proc. Ac. Nat. Sci. Philadelphia II, 108 (*nec* Fab., 1787, Mant. Insect. Hafniae I, 45).
Ips quadrisignatus sexpustulatus Reit., 1873, Verh. nat. Ver. Brunn XII, 161 (*nec* Fab., 1792, Ent. Syst. Hafniae I, 512).
Ips quadriguttatus Blatch., (partim), 1910, Coleop. Ind., 649 (*nec* Fab., 1776, Gen. Insect. Chilonii, 214).

Length 4-7 mm. Body black throughout; elytra black, each with a basal and post-median spot, the spots, especially the basal, variable in size and color; the basal oblique and partly enclosing the humeral umbone, usually sublunate, sometimes larger and subquadrate, sometimes reduced and divided to form two or three small spots, separated from the suture by a distance equal to or greater than the width of the scutellum, much closer to the lateral margin; the post-median spot transversely oval, never greatly reduced, occupying from one-third to three-fifths of the elytral width, a little closer to the sutural than to the lateral margin; the spots pale reddish-yellow or yellow in color, often reddish when greatly reduced. Puncturation closer and a little coarser than in *fasciatus*. Legs, pygidium, and elytra without sexual modification; the apical margin of each elytron broadly rounded, the elytral apices not at all produced. Flagellum as figured.

I have seen six specimens from Lawrence, Kans., and about a hundred taken by Mr. Siepmann at Avenel, N .J. As noted by Mr. Siepmann, this species differs from *fasciatus* in being a little less convex, slightly more parallel, and in having the lateral pronotal margins more strongly reflexed. Melsheimer has described the species form Pennsylvania and Blatchley from Indiana. The figure given by Blatchley probably represents the subspecies described below.

4a. **Glischrochilus quadrisignatus canadensis** n. subsp.

Male. Length 6.3 mm. Elytral spots yellow; the basal spot large, subquadrate, oblique, separated from the suture by a distance equal to the width of the scutellum, the length of its sutural margin three-fifths as great as the length of its posterior margin; post-median spot transversely oval, a little smaller than the basal spot, occupying seven-tenths of the elytral width. Other characters as in typical *quadrisignatus*.

Holotype—♂, Vernon, B. C., Aug. 1, 1923, (K. B. Hopping); No. 3377 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—22, same data, various dates and collectors.

The paratypes exhibit very little variation in the size of the elytral spots. To this subspecies, I refer all the Canadian specimens before me which are as follows: 1, Enderby, B. C.; 2, Agassiz, B. C.; 6, Vineland Station, Ont.; 1, Black Rapids, Ont.; 2, Ottawa, Ont.; 7, Fairy Lake, Hull, Que.; 6, Montreal, Que. Three small females, one from Ottawa and two from Montreal, have the elytral spots slightly reduced in size and thus approach the more heavily maculate specimens of typical *quadrisignatus*. All of the other specimens agree with the type series and show little variation in color.

The specimen figured as *Ips quadriguttatus* Fab. by Blatchley in his Coleoptera of Indiana probably belongs to the subspecies *canadensis*; the specimen was evidently taken in Illinois.

5. **Glischrochilus siepmanni** n. sp.

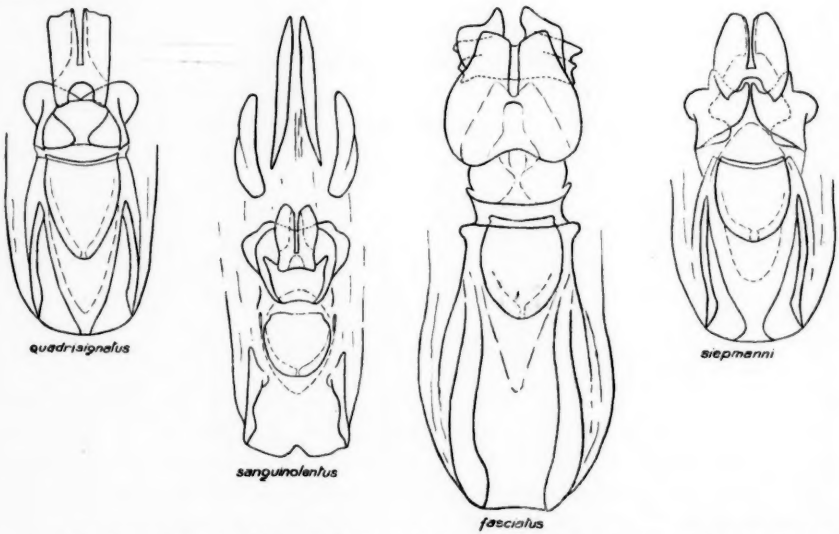
Male. Length 5.3 mm. Body black throughout; elytra black, each with

a small, pale yellow basal and post-median spot; the basal spot elongate, oval, and parallel to the suture, slightly longer than the scutellum, twice as long as wide, attaining the elytral base and situated midway between the lateral and sutural margins of the elytron; the post-median spot situated at apical third midway between the sutural and lateral margins of the elytron, occupying one-fourth the elytral width, slightly oblique, broadly oval, a little larger than the basal spot, its greatest diameter subequal to the length of the basal spot. Puncturation of body and elytra close and a little coarse. Legs, pygidium, and elytra without sexual modification, the apical margin of each elytron broadly rounded, the elytral apices not at all produced. Flagellum as figured.

Holotype—♂, Fairy Lake, Hull, Que., May 30, 1927, (W. J. Brown); No. 3376 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—1, same data as holotype; 1, Ile de Montreal, Que., June 12, 1908, (Beaulieu); 5, Ft. Coulonge, Que., June 6, July 12 and 27, and Aug. 22, 1927 and 1928, (J. I. Beaulne); 2, Ottawa, Ont., May 4, 1904 and Sept. 19, 1912 (C. H. Young and Beaulieu); 14, Aweme, Man., various dates between May and Sept., 1906 to 1928, (E. Criddle, N. Criddle, R. M. White); 1, Edmonton, Alta., May 8, 1917, (F. S. Carr); 7, Midday Val., Merritt, B. C., June 24, 1924 and July 3, 1924, (K. F. Auden); 1, Vernon, B. C., June 2, 1921, (R. Hopping).



In the allotype and in thirteen of the paratypes there is, in addition to the spots described above, an oval spot directly behind the humeral umbone. This spot is never more than half as large as the basal spot, is separated from the basal spot by a distance equal to twice the length of the latter, and only rarely are its margins as sharply defined as those of the other spots. It is sometimes very indistinct. The paratypes measure from 4 to 6.2 mm. in length. As in the allied species, the largest specimens are males in which the head is larger and the

body form more parallel than in smaller specimens.

I am able to distinguish this species from *quadrisignatus* only by the characters of the elytral spots and the flagellum. Some small females of the latter approach the present species in having the elytral spots strongly reduced. However, I have not seen such a specimen with the spots as small as in *siepmanni,* and in such specimens, the spots are always reddish, never pale yellow as in the present species.

6. **Glischrochilus vittatus** Say.

Ips vittata Say, 1835, Bost. Jour. Nat. Hist. I, 170; Lec. ed. II, 645.
Ips dejeanii Kby., 1837, Richardson's Fauna Boreali-Americana, 107, pl. II, fig. 4.
Ips sepulcralis Rand., 1838, Bost. Jour. Nat. Hist. II, 19.

Length 4 - 5.5 mm.; width 1.4 - 2 mm. Body feebly convex, elongate. Side margins of pronotum more or less oblique near the base and more or less sinuate immediately before the posterior angles, the latter therefore prominent. Elytron black, with pale yellow spots, three of these elongate, oval, arranged in a row parallel to and moderately distant from the suture, one basal, another at basal third (these often joined together), and the other at apical third, the spots except the basal frequently jointed with two more external spots which are sometimes reduced or obsolete. Elytral puncturation moderately fine and close. Elytral margins broadly rounded at apex in the male, the apical angles not produced; female with the margins oblique near the apex and the apical angles strongly produced.

I have thirty-eight specimens from Montreal, Hull, and Kazubazua, Que., Sudbury, Ont., Lake Dauphin, Man., Edmonton, Alta., and Crowsnest, Midday Valley, Trinity Valley, and New Westminster, B. C. The elytral spots are quite characteristic in form and color and have been figured by Horn (1879, Trans. Am. Ent. Soc. VII, pl. III, fig. 17). Randall described the species from Maine, and Horn recorded it from Alaska, California and Utah. Say's type was from "Arkansaw."

7. **Glischrochilus moratus** n. sp.

Male. Length 5.3 mm.; width 1.9 mm. Body feebly convex as in *vittatus* but less elongate than in that species. Head finely, not closely punctate. Pronotum with the sides moderately arcuate, feebly sinuate before the posterior angles, the latter slightly obtuse; disk sparsely punctate, the punctures very fine except near the lateral margins. Elytron black, the suture except in basal fifth and apical third pale red, this red band extending externally at its apex and obliquely to a point behind the humeral umbone at its base, a branch extending from behind the umbone to the base near the scutellum; this band subequal in width throughout, its width and the distance separating it from the lateral margin behind the umbone and at apical third subequal to the width of the scutellum. Elytral puncturation fine and close as in *vittatus;* the apical margins of elytra broadly rounded, the apical angles not produced.

Female. Length 5.3 mm.; width 2.1 mm. Elytral maculation as in the male; the elytral margins scarcely arcuate at apex, the apical angles slightly produced.

Holotype—♂, Aweme, Man., April 18, 1927, (N. Criddle); No. 3318 in the Canadian National Collection, Ottawa.

Allotype—♀, same data, May 4, 1920.

Paratypes—2 ♀, same data, March 29, 1906 and Oct. 24, 1900; 1 ♂, 1 ♀, Edmonton, Alta., May 8, 1917 and Oct. 10, 1914, (F. S. Carr); 1 ♀, Leduc, Alta., May 2, 1919, (F. S. Carr); 1 ♀, Cypress Hills, Alta., July 2, 1926, (F. S. Carr); 1 ♀, Summerland, B. C., Oct. 24, 1931, (A. N. Gartrell); 1 ♂, Copper Mountain, B. C., Sept. 13, 1930, (G. Stace Smith); 1 ♂, 3 ♀, Creston, B. C., April 15, 1930, Nov. 17 and 1, 1926 and 1931, (G. Stace Smith).

The paratypes measure from 3.6 to 6 mm. in length and vary considerably in color. In four of the paratypes, the red markings are not extended along the suture, each elytron being two-spotted as in most specimens of *lecontei*. In three of the specimens the markings are intermediate, extending more or less incompletely along the suture. In one specimen, the elytra are black and immaculate, and in another a basal spot only is present on each elytron. The larger females, as a general rule, are less convex than the males, and the usual variation occurs in the form of the head and prothorax. The species is much less convex and less coarsely punctate than *confluentus*.

8. Glischrochilus confluentus Say

Engis confluenta Say, 1823, Jour. Ac. Nat. Sci. Philadelphia, III, 195; Lec. ed. II, 125.
Ips confluens Lec., 1859, Writings of Thomas Say, II, 125.

Length 4.7 - 6.2 mm.; width 1.7 - 2.3 mm. Body moderately convex, elongate. Sides of the pronotum oblique before the base and variably sinuate immediately before the posterior angles. Elytral markings somwhat variable, the black areas consisting of the apical third, the lateral margin including the humeral umbone, the suture rather narrowly in basal third or half, a subsutural spot near base sometimes connected with the sutural stripe, and a large submedian spot rather narrowly connected to the lateral and sometimes to the sutural stripe. Elytral puncturation sparse, coarser than in any allied species. Elytral margins broadly rounded at apex in the male, the apical angles not produced; female with the margins feebly arcuate near apex, the angles slightly produced.

Three specimens from Ontario and Pennsylvania are before me. Horn states that the species occurs from Canada to Georgia, and Blatchley records it from Indiana. The species is more convex than any other except *lecontei*. The elytral markings have been figured by Horn (1879, Trans. Am. Ent. Soc., VII, pl. III, fig. 16).

9. Glischrochilus lecontei n. n.

Ips cylindricus Lec., 1863, Smith. Misc. Coll. 167, 64 (*nec* Oliv., 1790, Entomologie II, No. 18, 9).

Length 5.6 - 6.7 mm.; width 1.9 - 2.4 mm. Body rather strongly convex, more convex and elongate than in any other species. Lateral margins of pronotum not arcuate, almost straight, slightly converging basally. Elytral spots as in *moratus*, the basal spot subhumeral, more or less triangular, the posterior spot sometimes bent forward and extended to the suture, the spots obcure in one specimen and joined along the suture in another. Elytral punctures fine and sparse. Apical margins of elytra broadly rounded and the angles not produced in the males; the margins oblique and the angles strongly produced in the female.

I have five specimens from Kelowna, B. C. and Mono County, Cal. The species was described from "Nebraska" and has been recorded by Horn from Oregon and Nevada.

SOME NOTES ON ACTIAS LUNA (LEPID)

BY ROBERT E. BIRDSONG,
Vallejo, Calif.

Elliott and Soule in 'Caterpillars and their Moths' say of the luna eggs—"Luna eggs are as purely white as its own white scales. We have had many eggs of luna, and never one which was not white."

In a letter from Prof. Van Duzee of the Calif. Academy of Sciences, he writes, "While living in the East I have repeatedly secured the eggs of the luna moth and in all cases they were white."

Prof. E. O. Essig of the University of Calif. writes, "Your communication has proven to be especially interesting in view of the fact that one would expect to find many descriptions of the eggs of luna moths. Yet after a perusal of all of the important literature in America, I have failed to find any additional references to the descriptions of the eggs of this insect."

On April fourteenth of this year, a female *luna* emerged from one of my cocoons. The eggs she deposited were not at all white. A few days later another female emerged. This one I allowed to mate and her eggs were the same as the first depositor.

The eggs varied from a cream to a dark brown color. The microphyle on each was black and large enough to be plainly visible to the naked eye. The moths which laid these eggs appeared to be alike in all respects to the ordinary luna moth. I cannot account for the difference in the eggs.

In eighteen days the eggs hatched, the result being two distinct types of caterpillars. The first type was about a quarter of an inch long, tapering from head to anus. The head was green, bordered by a black line. The dorsal area was colored a yellowish-green. A lateral line of black ran the length of the body. The sub-dorsal area was a brighter green. The segments were separated in the dorsal area by a darker portion, giving the caterpillar a striped appearance. On each segment within the black lateral line was a small yellow dot.

The length and shape of the second type were the same as the first. The head was green, marked with black across the front. The general color was yellowish-green. The dark lateral line which appeared in the first type was entirely absent in the second. The segment divisions were the same hue as the rest of the body, the color being very evenly distributed. The caterpillars of the first type were the most abundant.

I fed the caterpillars on black walnut. Another set of luna eggs hatched a few days later and the caterpillars were of the same two types.

After the third molt the black lines of the first type disappeared entirely making the two types alike in every respect. The rest of the caterpillar stage agrees with all of the descriptions I have referred to.

Before the caterpillars had pupated I had to take a trip to Montana, and there being no one with whom I could leave the caterpillars, I was forced to take them with me. There were places on the trip where I could not obtain the food plants I knew they would eat. I fed them maple and apple, both of which they ate heartily. I have not seen these food plants listed for *Actias luna*.

The moths emerge in the spring, being invariably the same in description. The early stages seem to have no direct affect on the appearance of the moth.

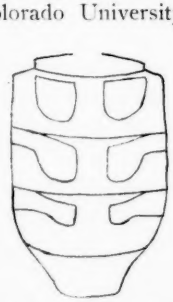
A NEW EOCENE SYRPHID FROM COLORADO (DIPTERA).

BY MAURICE T. JAMES,
Boulder, Colorado.

Syrphus (?) hendersoni n. sp.

Only the abdomen is preserved, but its markings are quite distinct, and indicate a Syrphid. Unfortunately, the wings are missing, so the exact generic relationship can not be determined; I am referring it to *Syrphus* at the suggestion of Dr. Charles R. Jones. The abdomen is dark, probably black in life, with pale markings consisting of bands on the second, third, and fourth segments, all interrupted by a median stripe; those of the second segment do not attain the lateral margins, and appear as two subquadrate spots, rounded on their posterior angles; those of the third and fourth segments reach the lateral margins and the bases of the segments laterally, but are separated from the bases toward the median stripe by a region of black. These spots are deeply arcuate on both margins.

"Green River Eocene, Sta. 25, Kimball Creek, Colo. Henderson and Byram, 1923." No. 15652, Colorado University Museum.



Quite possibly, this specimen represents an extinct genus. So far as I can ascertain, in the living species of *Syrphus* with interrupted bands on the third and fourth segments, as well as in the two Eocene species tabulated below, the half-bands do not attain the bases of the segments laterally, and either extend forward toward the middle of the segments or run about parallel to the incisures. The abdominal markings of *S. hendersoni* in this respect more nearly suggest a *Helophilus*, although the shape of the abdomen and other features of the abdominal markings indicate one of the Syrphini. Among the living species of *Syrphus*, this species approaches our American *S. arcuatus* Fallen and *S. opinator* O. S. It can be separated from the known Eocene species by the following table.

1. Arcuate bands of third and fourth segments attaining the bases of the segments laterally.....*S. hendersoni*, n. sp.
   Arcuate bands of third and fourth segments not attaining the bases of the segments laterally 2
2. Smaller species, 8 - 9 mm. in length.....*S. lithaphidis* Ckll.
   Larger species, 12 mm. in length.....*S. eocenicus* Ckll

Mailed Saturday, November 26, 1932.